Message

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Sent: 6/6/2019 12:57:07 AM
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Subject: RE: Check in on 6 & 7 topics
Attachments: Bore Scope Studies; tm100687.02a.pdf; SOW_Geologic-Characterization_Rev4.docx

Aloha Lyndsey,

Holding off on the call for now is fine. I will be out of the office Monday morning and not available until noon that day. Can we plan something for 3 pm Monday?

Here are a some key notes from our informal discussion the Navy. While we didn't have any meeting of the minds about our fundamental technical disagreements on WQ data and LNAPL approaches, we heard an early favorable response from Mark Manfredi on the value of pursuing additional, non-invasive data collection efforts to address data sparsity described below, and a request for access to conduct such studies. DOH is currently developing scopes for the following studies with UH and TetraTech. I have excerpted language from the attachments to give you an idea of what items are being considered.

1. **Fluid Transport Properties of the Red Hill Lavas -- UH MOA, with Scott Rowland, as PI**. Includes technical advisory role on contractor led Vertical Profiling and Bore Scope Studies of the Red Hill wells.

Problem Statement – the Navy's Red Hill Bulk Fuel Storage Facility (RHBFSF) stores approximately 200 million gallons of fuel in 18 underground storage tanks, the bottoms of which are separated from groundwater of the Moanalua and Waimalu Aquifers by as little as 100 ft of lava rock. Knowledge of the fluid transport properties of the rock formation surrounding and beneath the tanks is critical to understanding how fugitive fuel from the RHBFSF will migrate in the unsaturated zone and on the water table. Examples of rock characteristics that will affect fuel migration include but are not limited to: fracture frequency, fracture aperture, lava flow thickness, distribution and frequency of vesicles (for fuel holding capacity), geometry of the lava flows, and flow type.

2. **Vertical Groundwater Profiling at the Navy Red Hill Bulk Fuel Storage Facility - TetraTech Task Order**

OVERVIEW
Vertical groundwater profiling characterizes the variations within the saturated interval of a given observation well screen at the time of measurement. For the Red Hill Bulk Fuel Storage Facility (RHBFSF), performing vertical profiling may provide insights regarding the distribution and behavior of fuel-related impacts in the aquifer. The objective of the profiling is to determine: a) the potential dilution of chemicals of concern (COCs) and the LNAPL source generating those; b) changes in natural attenuation parameters; c) changes in temperature; and d) electrical conductivity variations.

Dilution of COCs relative to the fuel source feeding those impacts is common, particularly if the LNAPL source zone is relatively thin in comparison to the groundwater zone in contact with it. .....
Therefore, vertical profiling of COC concentrations may provide a direct indication as to whether dilution is an important factor at RHBFSF that needs to be considered in relation to groundwater impacts and the LNAPL source creating those.

3. **Bore Scope Flow Metering Studies** at **Navy Red Hill Bulk Fuel Storage Facility -To be included in TetraTech Task Order above**

Scope under development. See attached email for example of effective use at Waimanalo Gulch Landfill. Excerpt from the specs for the Collodial Borescope reads as follows:
•Observes flow at a pore scale for measuring velocities ranging from 0 to 30 mm/sec

•Generate flow and velocity models using existing wells – avoiding added costs associated with installing additional wells or piezometers
•Identify flow direction and velocity in real-time
•Capture statistical summary report that includes well number, date, vector analysis and more

APPLICATIONS

•Assessing groundwater capture zones
•Planning locations for monitoring recovery wells, and injection wells
•Accurately calibrating groundwater models
•Excellent alternative to slug tests and pump tests
•Tidal influences
•Industrial hydrology
•Gathering evidence for groundwater contamination litigations
•Evaluate "cross-hole" hydraulic connections

4. **Red Hill Shaft Water flow delineation** - Topic introduced - feasibility needs to be determined, and would be carried by Navy or with substantial assistance from them

   The Navy team has noted there is likely significant dilution of fuel-related impacts at Red Hill Shaft (we can't find it in writing, but I recall a value of 30x being used by them). Because of the variance in hydrogeologic units intersecting the shaft (see attached), and that the shaft was logged to produce most of its water from the interior end (eastern), t is possible that there is a difference in groundwater quality/impacts across the shaft. Also, given the relatively high historic detections at the Shaft, it is **possible** that there have been direct LNAPL impacts in limited pockets. To better understand the risk potential to the Shaft and its current conditions, discrete sampling along the shaft production zones would be useful. Along with groundwater sampling, it would be of interest to have a high intensity UV light with a 350 nM wavelength to inspect for potential hydrocarbon fluorescence. If there are any such indications, a physical sample could be chiseled out for chemical analysis to verify potential impacts. The logging of sample locations would be done with a high resolution GPS unit, or if there is no signal in the Shaft, then done manually relative to a known bench mark.

5. **Implementation of continuous data collection from all soil vapor probes in the tank farm.** Navy Action, DOH would assist with trend monitoring.

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Sent: Wednesday, June 5, 2019 11:51 AM
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Cc: Shalev, Omer <Shalev.Omer@epa.gov>
Subject: Check in on 6 & 7 topics

Hi Fenix and Lene,
I got a voicemail from Fenix earlier today about setting up a time for all of us to discuss a few outstanding issues on AOC sections 6 & 7. As I understand it, the topics to cover are:

-Response to Navy about LNAPL modeling
-DOH Meeting with Aaron from NAVFAC
-General Flow model approvability (from our conversation on Monday)

and potentially

-Vapor Monitoring Data (from ongoing emails/discussions)

Unfortunately due to the schedules on our end we won't all be available to discuss this until Monday, but we are hoping HDOH can join the regular conference line a half an hour early at 9am Hawaii time so we can all talk then. We think we can cover most of the above in 45 minutes and still touch on other sections before the regular call with the Navy at 10. Please let me know if this time will work for you both.

Thanks,

Lyndsey Tu
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